

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), November 2017
B.Tech. in Computer Science and Engineering, Semester III

CSE301: DATA STRUCTURES

Roll No.....

Time: 03 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. Ordered files with primary index are called
 - A). Linear spanned file
 - B). Relative spanned files
 - C). Indexed sequential file
 - D). Indexed spanned file
- ii. Graphs are represented using
 - A).Adjacency tree
 - B).Adjacency linked list
 - C).Adjacency graph
 - D).Adjacency queue
- iii. The number of swapping's needed to sort the numbers 8, 22, 7, 9, 31, 19, 5, 13 in ascending order, using bubble sort is
 - A).11
 - B).12
 - C).13
 - D).14
- iv. Disadvantage of using array representation for binary trees is?
 - A).difficulty in knowing children nodes of a node
 - B). difficult in finding the parent of a node
 - C). have to know the maximum number of nodes possible before creation of trees
 - D). difficult to implement
- v. The correct matching for the following pairs is
 - (A) All pairs shortest path
 - (1) Greedy
 - (B) Quick sort
 - (2) Depth-first search
 - (C) Minimum weight spanning tree
 - (3) Dynamic programming
 - (D) Connected Components
 - (4) Divide and conquer
 - A). A-2 , B-4 , C-1 , D-3
 - B). A-3 , B-4 , C-1 , D-2
 - C). A-3 , B-4 , C-2 , D-1
 - D). A-4 , B-1 , C-2 , D-3
- vi. A graph with all vertices having equal degree is known as a
 - A). Regular Graph
 - B). Multi Graph
 - C). Simple Graph
 - D). Complete Graph
- vii. turns out that one can find the shortest paths from a given source to all points in a graph in the same time.
 - A). Kruskal's algorithm
 - B). Prim's algorithm
 - C). Dijkstra algorithm
 - D). Bellman ford algorithm
- viii. A binary tree in which every non-leaf node has non-empty left and right sub-trees is called a strictly binary tree. Such a tree with 10 leaves

- ix. One way to eliminate all clustering is
- A). Quadratic rehash B). Rehashing
C). Hashing D). Double hashing
- x. The Data structure used in standard implementation of Breadth First Search is?
- A). Stack C). Linked List
C). Queue D). None of the mentioned

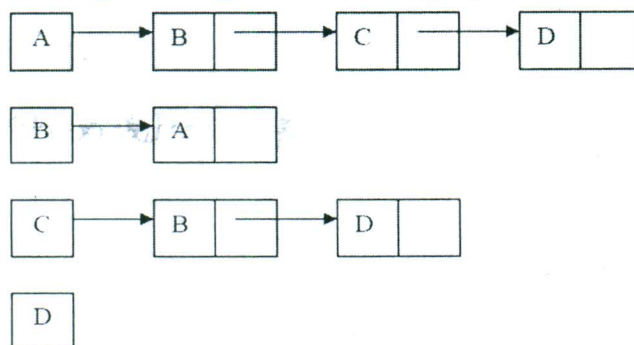
Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- What are the two properties of a good hash function?
- List the applications of graph?
- Define spatial and Temporal locality of indexes?
- What are the advantages of Linked List over arrays?

Q.3A Here is an adjacency list representation of a directed graph where there are no weights assigned to the edges).

05



- Draw a picture of the directed graph that has the above adjacency list representation.
- Another way to represent a graph is an adjacency matrix. Draw the adjacency matrix for this graph.

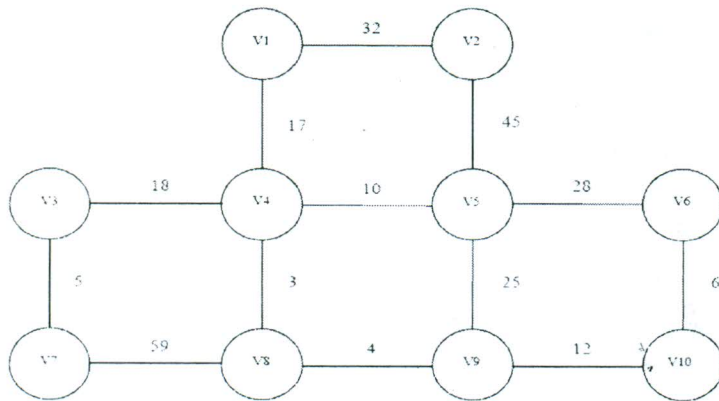
Q.3B Seven pirates attacked the British ship and looted some rare gems from them. They decided to rest for some time and then divide the gems later. While everyone was resting, two pirates wake up and planned to divide gems equally between the two. When they divided gems equally, one gem was left. So, they decided to wake up the third pirate and divide among three, but alas again one gem was left. They decide to wake up the fourth pirate to divide the gems and again one gem was left. The same happened again with the fifth and sixth. Finally, they woke up the 7th pirate and this time the gems were divided equally.

05

How many minimum gems did they steal in total?

Q.4A Execute Prim's and Kruskal's algorithm to find the minimum spanning tree of the following graph. Also mention the total cost of MST?

05



- Q.4B If the following sequence of numbers is to be sorted using quick sort, then show the iteration of sorting process- 05
42, 34, 75, 23, 31, 18, 90, 67, 78, 15

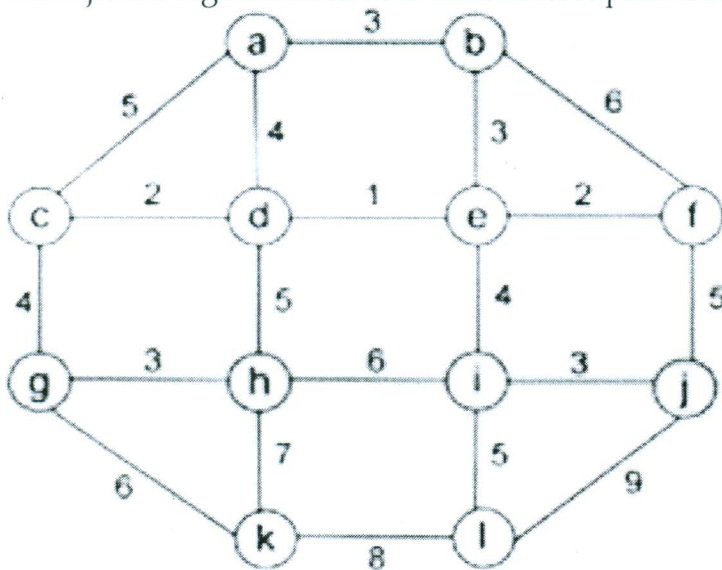
OR

- Q.4B Show the series of steps taken by the Bubble Sort algorithm while sorting this list. 05

09, 20, 06, 10, 14, 08, 60, 11

Also write algorithm and time complexity of the Bubble sort algorithm.

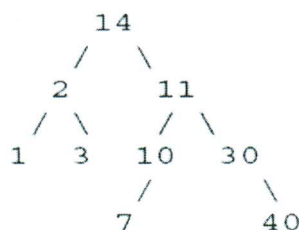
- Q.5A Use Dijkstra algorithm to find the shortest path from all nodes to all nodes. 05



- Q.5B Demonstrate the selection sort results for each pass for the following initial array of elements- 05
21, 6, 3, 57, 13, 9, 14, 18, 2, 35
Also write its algorithm?

OR

- Q.5B Here is a small binary tree: 05



A. What are all the leaves?

C. What are the ancestors of the node 10?

- D. What are the descendants of the node 11?
 E. Is the tree a binary search tree (BST) and AVL Tree?
 F. Print the tree when visited in post-order manner?

Q.6A Construct a Binary Tree from Given Inorder and Depth-First-Search. 05
 Inorder - M, P, E, U, B, S, F, O, D, T, L, J, W
 Depth-First-Search - S, P, M, B, E, U, L, O, F, D, T, J, W

Q.6B Given a sorted linked list, delete all duplicates such that each element appears only once. Write algorithm for this and also mention its complexity. 05
 For example,
 Given 1->1->2, return 1->2.
 Given 1->1->2->3->3, return 1->2->3.

Q.7A Build an AVL tree with the following values: 05
 12, 16, 28, 11, 15, 5, 45, 23, 68, 9, 78, 105, 98, 88
 Remove 5 and 15 from final AVL tree.

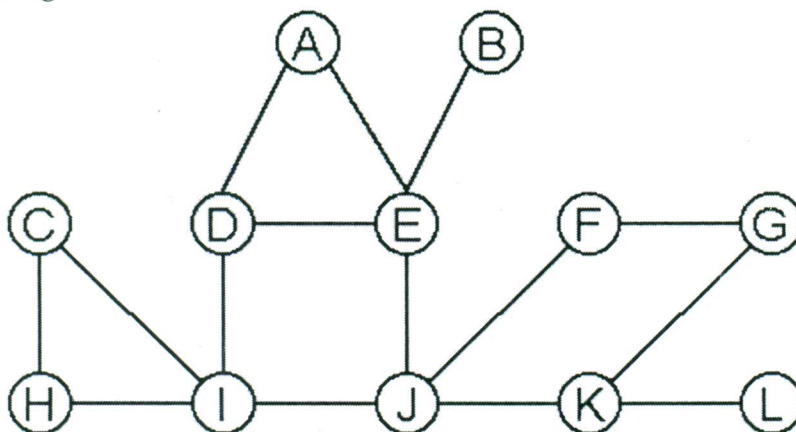
Q.7B What do you understand by term file organization? Briefly summarize the 10
 different file organizations that are widely used today? Explain the significance of multi-level indexing with an appropriate example? What are inverted files? Why they are needed?

OR

Q.7B Consider the list of numbers: 10
 62, 31, 89, 105, 67, 21, 76, 70, 91, 25, 11, 9, 61, 73, 6, 4, 56
 1. Show the result of inserting the numbers in the list in the same order specified above into an initially empty minimum heap.
 2. What will happen to heap after 62 is deleted?
 3. Explain how you can utilize a minimum heap to sort the list of numbers in descending order. Let n be the number of elements in the list. What is the time complexity of your sorting algorithm?

Q.8A Draw the 12-item hash table resulting from hashing the keys 05
 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, 5, 36
 using the hash function $h(i) = (2i+5) \bmod 11$ and handling collisions using chaining

Q.8B Show the result of running BFS and DFS on a directed graph given below 05
 using vertex A as source. Show the status of the data structure used at each stage



Q.9A You have 1000 wine bottles, one of which is poisoned. You want to 05
 determine which bottle is poisoned by feeding the wine to the rats. The

poisoned wine takes one hour to work. How many (Minimum) rats are necessary to find the poisoned bottle in one hour?

Q.9B Show the result of inserting these integers (in this order) into an initially empty Splay tree: 10

8, 1, 4, 2, 5, 15, 7, 3, 6

(a) Make sure to show the tree after each insertion. You might consider showing the patterns we used to define the various insertion situations that are possible.

(b) Show the tree after doing delete 4 on the result from (a)

(c) Show the tree after doing delete 7 on the result from (b)

(d) Show the tree after doing find 2 on the result from (c)

(e) Show the tree after doing find 6 on the result from (d)